THE
FOREST TREE PLANTER'S
MANUAL.

SIXTH EDITION.

By J. O. BARRETT,
SECRETARY OF THE ASSOCIATION.
BROWNS VALLEY, MINN.

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THE
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THE FORESTRY MOVEMENT IN THIS STATE.

The subject of forest culture in Minnesota, almost unknown, or at least little appreciated twenty years ago, has recently sprung to a front rank in the economic questions which relate to the welfare of our state. While only the eastern, or river counties of Minnesota were occupied by settlers, as was the case 20 to 25 years ago, it was supposed that there was an ample supply of timber already grown in our forests to serve the wants of the people for generations to come. Our pine forests were declared by writers to be "inexhaustible," and the hard wood forests of eastern and middle Minnesota seemed ample for all uses, and all possible consumption.

But with the rapid increase of population commencing after the war, and simultaneous with the building of our railroads, the features of this picture began rapidly to change. Those railroads began to carry armies of settlers out on the prairies in the western half of the state, where the supply of timber for their use was exceedingly meagre, or wanting altogether. The railroads themselves were insatiable consumers of the forests. To supply them with ties alone, our woodlands were drawn on heavily, while these had to be renewed every 7 to 10 years. Their locomotives used enormous quantities of fuel, which soon enhanced in price along their lines. The main supply of fuel for the large and increasing population on the bare prairies—to say nothing of the demand from several rapidly growing cities,—was drawn from the forests in the eastern and central counties, and the prices soon began to advance, while the forests commenced to show the marks of this heavy demand. It was evident to a few thoughtful persons that the time was rapidly coming when the supply of fuel in Minnesota would grow less and less, and become practically exhausted, and this, too, in the face of a fast increasing population,—prices would advance so as to be a burden on consumers, while the trades and manufactures dependent on a supply of timber would be greatly embarrassed and crippled, and all interests suffer serious impairment.

Just at this period, too, the same note of alarm was sounded from

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other parts of the country. There appeared to be a general waking up among political economists and publicists, and scientific men, to the unwelcome fact that the country was being denuded of its forests at a rate which threatened a general timber famine within a startlingly near period. In fact the Nation was rapidly nearing the "danger-line" of scarcity. The statistics of consumption and destruction of our national timber supply, gathered about this time, were truly alarming, while the effect of this destruction of the great forests which were once such a feature of the country, was evident in the decreased volume of our rivers, the destructive droughts, and equally destructive freshets, and the changing climate. It was evident to all who gave the subject any consideration, that there must be a general and active movement throughout the country to arrest the reckless destruction of our forests, and to restore, in a measure, what had been stripped from the land. For two centuries, writers on forestry declared the people of America had seemed bent only on destroying their forests. We must now reverse this process, they said, and *plant forests*, instead of cutting them down. But this was a work so unusual and so strange to the people of America, that it has not even yet become general and its importance is still regarded with apathy by even well informed people, while want of experience and information on the subject of tree planting retards much advance in the process of reforesting the denuded regions.

Our own state was peculiarly situated in reference to this subject. A considerable part of its area was prairie, so sparsely supplied with native forests that only a few of the first settlers could secure any whatever for their wants. The rest were put to great straits to secure even fuel. Fencing was almost out of the question. Lumber for the most necessary wants had to be transported great distances, at corresponding cost. While on the bleak prairies the poor settler had not so much as a shrub to break the force of the violent storms of arctic cold and blinding snow which frequently swept over the prairies, and in which often not only cattle, but even human beings perished. Under such a state of affairs, the settlement of many of our western counties would be greatly retarded, and even many of those who had already made homes there would be discouraged and tempted to emigrate, unless some protection could be provided from the severe storms, and the bleakness of the prairies be modified by groves of trees. But, while all saw the importance of planting trees, but few knew how to procure or raise them. To disseminate the necessary information among these, and to aid and encourage the tree planting movement on our prairies by all possible means, was the motive for the organization of the "Minnesota State Forestry Association" in St. Paul, Jan. 13, 1876, since which time it has distributed over 20,000 copies of its Manual of instructions, the most of which have gone into the hands of actual settlers and landowners in our state, and have acquainted thousands of our citizens with the elements of practical forestry, enabling them, through the directions given, to start groves of trees which have demonstrated that only energy and patience is necessary to cover a good proportion of our prairie regions with valuable forests of the best timber.

VALUE AND NECESSITY OF FORESTS.

In the earlier editions of this Manual, considerable space was given to essays and addresses by different authors, on the value of forests as a means of modifying the climate, as a shelter from storms, a protection to the crops, &c., as well as the necessity of a general movement towards planting and cultivating woodlands to restore the forests ruthlessly destroyed during the past century, and thus supply the country with the timber necessary for its wants. It is believed now, that these questions are pretty well understood by the land-owning and cultivating population at large, having been so widely and repeatedly reiterated by the public press, and in agricultural and other publications, so that it is thought that no very extended presentation of this aspect of the forestry question is needed in the present edition of the Manual. So far as our particular wants in this State are concerned, however, the following extracts from an address delivered by Prof. C. Y. Lacy, before this Association, present the value and necessity of planting a portion of our prairie region with forests, in a very clear and concise manner. It said of the western part of the state—

(1) That the winds are too violent.

(2) That there is no wood for fuel, and no material for fencing.

(3) That the landscape is too dreary and monotonous—there are no trees to give it a homelike appearance; it is too lonesome.

(4) That it is too cold out there.

(5) That you can not raise fruit there.

(6) That it is unhealthy.

Reports come to us—

(7) That the forests that now supply us with lumber for building and manufacturing purposes are fast melting away before the woodman's axe.

(8) The reports of destructive insect invasions have not yet ceased to vibrate in our ears.

Every year we hear—

(9) Of hail storms doing extensive injuries.

(10) Of floods and freshets carrying away bridges and dwellings, and destroying growing crops and human life.

(11) Of the injurious effects of long continued drought.

(12) Of the substitution of improved water wheels for those that formerly gave sufficient power, and, finally, the complete substitution of steam for water power in mills and manufactories.

Every year we listen to—

(13) Appeals for the improvement of commercial water routes.

All these objections, reports and appeals indicate imperfections that are commonly supposed to be without natural remedy; but it is claimed for forests; and with good reason, too, that they are the natural remedy for some of these imperfections, and the natural means of relief in the case of others. It is claimed for forests that they—

(1) Break the force and melt the fury of the winds, and thus afford shelter and protection to man and beast.

(2) That they supply fuel and material for fencing.

(3) That they give a homelike character to the prairie that is otherwise dreary and monotonous.

(4) That they mitigate the cold of winter and the heat of summer.

(5) That they improve the conditions for fruit-growing.

(6) That they improve the sanitary character of some localities.

(7) That they supply lumber for building and manufacturing purposes.

(8) That they diminish insect injuries, and

(9) The injuries of hail storms.

It is claimed that forests affect favorably the water supply of a region.

(10) Diminish the destructive effects of freshets.

(11) Diminish the injurious effects of drought.

(12) Increase the flow of springs.

(13) Equalize the quantity of water in our mill and navigable streams, and

(14) Distribute the rainfall throughout the year.

It has been abundantly shown, in this and other States, that trees can be grown, in large numbers or in small, on any soil that will produce ordinary farm crops. This is all that is required to establish several of the above claims Every one has observed the capacity of trees—

(1) To break the force of winds.

(2) To supply fuel and material for fencing.

(3) All who have traveled over the prairies know how welcome is the sight of a belt or group of trees, and how much more habitable and homelike is a house surrounded with trees than one standing alone.

(4) If forests break the force of the winds, we are prepared to understand how they mitigate the cold, for we all know how much colder it seems in windy than in calm weather. Some of you have noticed the difference in passing from forest to open country. Firemen on railway trains observe that additional fuel is required to keep up steam on passing from wooded into prairie regions.

(5) If forests break the force of winds and modify the cold of winter, they certainly improve the conditions for the growth of fruit. Horticulturists are pretty well agreed upon the value of a protecting forest, either natural or artificial.

(6) In a paper read before the American Public Health Association, last fall, Dr. Geo. L. Andrew reached, among other conclusions, the following: That 'forests and tree belts are of undoubted value in preventing the dissemination of malaria;' that 'trees are of positive sanitary value in affording shelter from the excessive heat of the sun, from the violence of the winds, and in promoting aesthetic culture'; that in some cases, 'extensive tree planting is not unaccompanied with evil.'

(7) To furnish lumber for building and manufacturing.

(8) There is little doubt but that forests diminish insect injuries. Insects do not multiply so rapidly in and near the woods, for there the birds, the consumers of insects build their nests and find protection. Marsh says: 'It is only since the felling of the forests of Asia Minor and Cyrene that the locust has become so fearfully destructive in those countries.' It is pretty well established, too, that the native breeding places of our locust are barren plains, and not forest covered regions. I think it has been found, too, that the locust plague is less severe in and near forests than on the open prairies. There is good evidence to the effect that—

(9) Forests render hail storms less frequent and severe. Hail storms on the plains of Lombardy are believed to be more frequent than before the clearing of the forests on the Alps and Appenines; and in several other provinces of Europe, hail storms are believed to be more frequent and destructive since the clearing of the forests in their vicinity.' "

THE MOTIVES FOR TREE PLANTING.

The objects, therefore, of those who plant trees in this state, would undoubtedly be embraced in one of the following propositions:

1. To secure a "wind-break," or shelter from "blizzards" and snow-storms, for the sake of comfort and security to human life, and stock.
2. For shade around dwellings and barns, and along road-sides, and ornamenting country residences and farms.
3. For fuel and fencing, important considerations in a prairie region.
4. For an ultimate supply of valuable timber, for the market.

While there are many persons who are encouraging the forestry movement mainly because they realize its necessity, and see its future value to the commonwealth, we may as well presume at the outset that most of those who plant trees do so in hopes of securing some return, and that as speedily as possible. At present it is hardly to be expected that very many in this state will engage to any extent in the fourth division of the forestry movement, as above noted. The hope of most of the prairie settlers in planting trees, is to secure wind-breaks and shelter as quickly as possible, and after a little further time, to have a supply of fuel and fencing material. This of itself is a valuable work, and many who plant a few acres with no other object, will, if they manage their plantation properly and plant good varieties of trees, find themselves in a very few years in possession of a *forest*, which will yield them an annual income, and ultimately become very profitable as merchantable timber.

TREES INDIGENOUS TO MINNESOTA.

The following is a list of the principal timber trees found growing in the forests of Minnesota:

White, or Silver Maple	*Acer Dasycarpum.*
Red, or Scarlet Maple	*Acer Rubrum,*
Hard, or Sugar Maple	*Acer Saccharinum.*
Ashleaved Maple (box-elder)	*Negundo Fraxini folium,*
White Oak	*Quercus Alba.*
Burr Oak	*Quercus Macrocarpa.*
Red Oak	*Quercus Rubra.*
Black Oak	*Quercus Tinctoria.*
Black Jack, or Jack Oak	*Quercus Nigra.*
White Ash	*Fraxinus Americana.*
Green Ash	*Fraxinus Viridis.*
Black Ash	*Fraxinus Sambuci folia.*
Black Walnut	*Juglans Nigra.*
White Walnut (butter-nut)	*Juglans Cinerea.*
Shell-Bark Hickory	*Carya Alba.*
Pig-Nut Hickory	*Carya Porcina.*
Black Cherry	*Cerasus Virginiana.*
Red Cherry	*Cerasus Pennsylvanica.*

White Elm Rock Elm	*Ulmus Americana.*
Cork Elm	*Ulmus Racemosa.*
Red, or Slippery Elm	*Ulmus Fulva.*
Cottonwood	*Populus Monolifera.*
Silver or White Poplar (Abele)	*Populus Alba.*
Balm of Gilead	*Populus Candicans.*
Quaking, or American Aspen	*Populus Tremuloides,*
Large Toothed Aspen	*Populus Grandidenta.*
Linden, or Basswood	*Tilia Americana.*
White Pine	*Pinus Strobus.*
Norway Pine	*Pinus Resinosa.*
Tamarac, or American Larch	*Larix Americana.*
Red Cedar	*Juniperus Virginiana.*
White Spruce	
White Cedar, or Arbor Vitæ	*Thuja Occidentalis.*
Yellow Birch	*Betula Excelsa.*
White Birch	*Betula Populi folia.*
Canoe Birch	*Betula Papyracea.*
White Willow	*Salix Alba.*
Red Mulberry	*Morus Rubra.*
Hemlock	*Tsuga Canadensis.*
Iron Wood	*Olneya Tesota.*
Kentucky Coffee Tree	*Gymnocladus Canadensis.*
Hackberry	*Celtis Occidentalis.*

The above certainly comprise sufficient varieties for the tree grower to select from, for almost any purposes. In addition to the above, the following imported varieties have been extensively planted, and found to succeed well:

Russian Mulberry	*Moruf Tatarica.*
Lombardy Poplar	*Podulus Dilitata.*
Scotch Pine	*Pinus Sylvestris.*
Austrian Pine	*Pinus Austriaca.*
European Larch	*Larix Europœa.*
Norway Spruce	*Abies Excelsa.*
Diamond Willow	*Salix Cordata.*

PREPARATION OF THE SOIL.

[BY L. B. HODGES, LATE SEC'Y OF THE ASSOCIATION.]

Experience has demonstrated beyond cavil, that a proper and thorough preparation of the soil is a prerequisite of success. Were I to fit up a ten acre piece of prairie for the planting of a tree claim, under the provisions of the Congressional Timber Culture Act, this is about the way I should do it:

I would break the prairie in June, from the 15th to the 25th, if possible. I would break it about three inches deep, and do it well. No baulks or "cut and cover" should be tolerated. The sod should be all cut clear and all turned over; whether "kinked" or jointed down flat, makes no difference, so you only break in the proper season, and do it well. In the following October you will find the sod tolerably well decomposed, and also an inch or so of soil beneath the sod. Then, either cross-plow or back-set, going from one to two inches deeper. The following spring this soil is in good condition for a crop. Any kind of a hoed crop is preferable to small grain, because to grow corn, potatoes, &c., profitably, requires thorough cultivation, and just this thorough cultivation which your hoed crop demands, is just the treatment the soil needs in fitting it up for tree planting. Another year of such cultivation before the trees, cuttings, or tree seed is planted, is advisable, if you have time. If not, go ahead with your planting.

Clean culture till the trees have so far grown and developed as to completely shade the ground, is just what you must have to produce the most satisfactory results, after which the annual falling of the foliage mulches the ground and renders further cultivation superflous.

The foregoing remarks are intended to apply to the common average undulating or rolling prairie. There is, however, a very large amount of very smooth and level prairie in western Minnesota, especially in the valley of the Red River, where the treatment should be somewhat different. Much of this land is covered with a short, thin growth of the meanest sort of slouch grass. The sod is tough, very tough; in fact, as *tough* is no name for it. Unless broken the proper season, it might as well not be broken at all. If you break it too early, the grass grows up through it much more luxuriantly than ever before. If you break it a little too late it bakes down like an adobe brick, and requires time, frost, air and moisture to slack it. There is no particular use in trying to raise any kind of a crop on such land the next year after breaking. My own experience in treating this sort of prairie, is to break the last of June and first of July. Let it lay for about a year, and then either back-set or cross-plow, bringing up as much fresh dirt as you can. In fact, I would summer fallow it the next season after breaking, and I think the second season after breaking the sod I would sow it to wheat. By this time the ameliorating influences of sun, air, frost, moisture and summer fallow, will have so far operated on the obtuse and refractory nature of the soil as to have changed to a great extent its naturally sour, cold, disagreeable character, and put it in condition to begin to repay the labor heretofore bestowed upon it.

There are latent virtues in such land well worth developing. Once brought out, and you will be amply repaid for the extra time and labor it has cost. Most any kind of good manure is a sovereign panacea for this sort of prairie; not because the ground is lacking in fertility, for it is not, but because the manure acts as an alternative, neutralizing the sourness of the soil. This sort of land once thoroughly conquered, will prove of inexhaustible fertility, and, I feel confident, would then produce a thrifty growth of black and gray ash, basswood, red, white and rock elm, Hackberry, cottonwood, box elder, white willow, tamarac, soft maple, ironwood, wild plum, cherry, crab apple, and probably other varieties of timber, and will prove to be admirably adapted to wheat, oats, barley, all vegetables, and timothy, blue joint and red-top grasses.

Having brought the soil into good condition to commence the planting, the next question for the tree-grower to consider, is, how to gather and plant the seeds. On this subject we insert entire, an exceedingly valuable paper, prepared at the request of the secretary of this association, by Dr. John A. Warder, of North Bend, Ohio, one of the most experienced and able writers on the subject of sylviculture in the United States:

THE PROPAGATION OF TREES FROM CUTTINGS.

The following directions are from a paper read by L. B. Hodges, before the state horticultural society, in 1877:

Your ground must be good ground; it must be thoroughly subdued and mellow before planting; and right here I propose to point out and expose the practical nonsense and absurdity of the proposition that a cutting will grow anyhow, so you only stick it in the ground. Acting on this absurd proposition, hundreds of thousands of all sorts of cuttings, have been stuck in all sorts of ground by all sorts of people. The *results* are well illustrated in the parable of the sower.

The cutting, plunged full length into a deep, rich, mellow soil, under the vivifying influences of heat and moisture, soon begins to expand its buds, and throw out its slender, thread-like, fibrous roots. If the ground has been properly prepared, those roots at once begin to draw nourishment for the incipient tree; the buds grow into branches, and in a few months you have a thoroughly developed forest tree; and the better cultivation you give this young tree, the sooner you get a tree that is of some use in the world.

On the other hand, the cutting stuck in the raw sod, makes a failure in trying to get its roots into the hard earth in a vain attempt for nourishment, struggles along in a feeble, quiet sort of a way until dry weather sets in, and then quietly starves without a struggle or a groan, and the innocent author of this miserable abortion wonders what ails his trees, and sometimes gets mad, and uses "cuss-words" about the man who sold him the cuttings.

To go back to the starting point: Break your prairie in June; break shallow — back-set or cross-plow last of September, turning up two or three inches of fresh dirt.

If in a hurry (to save your claim) harrow thoroughly, and plant your cuttings right along up to the time the ground shuts up, and, if not through finish up the job early in the ensuing spring. If not in a hurry, it is a good practice to raise a crop before planting cuttings. A hoed crop is best, and, if well cultivated, leaves the ground in admirable condition for tree-planting. If you sow small grain before planting, you can't be too careful in getting your seed *perfectly clean.*

A few grains of wild buckwheat, or, what is more to be dreaded, pigeon grass, will give you an infinite amount of trouble, and by increased labor in keeping it down, double the cost of growing the forest.

In growing a wind-break, from cuttings, for a single row, I would prepare a strip of ground not less than 8½ feet wide, by deep plowing and thorough harrowing.

I would have the ground as mellow as an ash heap.

I would draw a line lengthwise along the center of this strip, and about every twelve or eighteen inches would plunge the cutting in nearly or quite full length, and at once tramp the mellow earth firmly around the cutting; and then I would keep that strip of ground clean as a hound's tooth. I wouldn't allow a weed or blade of grass to grow on that strip dedicated to the wind-break; and I should keep the cultivator running up and down the margin each side the row of young trees pretty often till harvest time, after which, if any weeds or grass had put in an appearance, would pull them up, carry them off and burn them up.

I would repeat this process the next season, and in the fall would mulch heavy with good manure.

I think, by that time, you will have that strip of prairie pretty well bull-dozed, and a wind-break started that won't dry out or freeze out, and which will stand and grow in spite of grasshoppers or other enemies.

TIME OF PREPARING CUTTINGS.

As far as the willow is concerned, most any time will do.

I have cut them nearly every month of the year, yet would prefer cutting and planting right along through the month of May, as being then liable to less loss and better growth.

I confess, in my own experience, to more satisfactory results with cottonwood cuttings cut and planted in October and November than in any other month.

As far as willow, cottonwood and Lombardy cuttings are concerned, good, fresh, healthy ones are about as sure to grow (in Minnesota) if properly handled, and under the most favorable circumstances, as either corn or potatoes; *failure* is not necessary. Do your work intelligently, and thoroughly, and at the proper time, and *success* is the rule.

CARE OF CUTTINGS TILL PLANTED.

In the fall of 1874, I caused to be cut and hauled together enough white willow to make five hundred thousand cuttings. I reduced some of this brush to cuttings in the fall, tied them up in bunches of a hundred each, set them up on end in trenches dug about a foot deep, threw a foot of dirt over them and let them lay till spring. The balance was stacked in good shape, covered with a layer of slough hay—threw enough loose dirt over it to keep the wind out, and let the thing go till it thawed out in the spring—then uncovered it, worked it up into cuttings and planted them. They came good and grew well, and I never knew any difference between those buried in trenches or those of the stack. Whenever, in the course of human events, I found a lot of cuttings drying up, and apparently worthless, before planting I would "swell 'em up" by throwing them in the most convenient lake, pond or stream. But a good way is to keep them buried in the trench until you are ready to plant.

There are plenty of cottonwood trees in Minnesota propagated from cuttings in the manner I recommend, now big enough to make a cord of wood each—17 to 20 years from the cuttings.

You can grow 300 such trees to the acre. Can you grow anything that will pay better?

ON SELECTING CUTTINGS.

In selecting cuttings, choose clean, two-year-old wood, or strong, well-ripened one year. Cut from eight to ten inches long, and as near one-half inch in diameter as economical cutting will allow. Larger cuttings will root and do nearly as well, but are more expensive to transport and handle.

Never cut them when frozen. If cut in autumn or during warm days in winter, pack in damp straw or saw-dust until wanted. These will bear transportation long distances, even with careless packing.

HOW TO PLANT YOUNG TREES

BY L. B. HODGES.

In the first place, prepare the soil as before directed. In September I would plow the ground as deep as I possibly could; the deeper the better; and then I would harrow thoroughly. I would have all the holes dug before I took up a tree, and I would dig big holes, not very deep, but a good ways across; deep enough so as you can throw in dirt, good mellow black soil, forming a little mound in the bottom of the hole to set the tree on. Then while an assistant holds the tree in an upright position, manipulate the fine, soft, mellow earth all among the roots, spreading them out full length, so they nestle and lay comfortable like and natural. If any of the roots are bruised and mangled, trim them off smoothly with a sharp knife, and also cut out all dead roots.

Too much care cannot be exercised in transplanting forest trees. In taking them up get all the root you can, especially small fibrous roots.

Don't allow the roots to be exposed to sun or wind. Don't let them freeze while out of the ground. Plan your work so as to have the least possible number of hours intervene from the time the tree is lifted from its native soil till it is in the ground again. Should unavoidable delays occur, heel them in, or better still, bury them all over in loose earth, taking them out as you plant them. After getting the roots comfortably arranged, shovel the fine black, mellow soil in, pressing it firmly. You don't want to tramp it.

I think most good sized trees, especially the cottonwood, do better planted somewhat deeper than they originally stood.

Don't drown your trees with water. Many people heave in several buckets of water in each hole. This is unnecessary. Your tree don't want to stand in a mortar bed. More trees are killed by too much water than by too little. If possible, mulch thoroughly as soon as planted. Mulch with any good manure. Chip manure is best. Old hay or straw is good.

If the ground is reasonably moist when the planting is done, good, thorough mulching will protect the tree from drouth far more effectually than indiscriminate bucketfuls of cold water. Cold water is a good thing in its place, but needs to be used with some judgment.

Don't mutilate your trees. This trimming up to bare poles and then cutting the top off may be necessary in very exposed localities, as too much top resists the wind to such an extent as to loosen the hold of the roots to the soil. This won't do. In such localities plant small trees.

A tree no larger than a rawhide riding-whip, with its full complement of fibrous roots, will soon get away from such trees as are usually planted along highways; *provided, always*, you plant it in ground which has been thoroughly prepared, and then give it the same care, protection and cultivation you do your corn when you get fifty bushels per acre. If I was in a hurry, and couldn't wait, and must have big trees at once, I would take up root enough so there would be no necessity of cutting off the top; only trimming the top into symmetry. It would be, perhaps, necessary to steady and brace it against the wind until well rooted. How to do this your own ingenuity should suggest.

We must preach to the people that a tree, if not exactly animal, is at least, a living, breathing organism, as susceptible to good or bad treatment as anybody; as quick to appreciate good treatment as you or I, and as quick to resent bad treatment. In fact there are few classes of beings who tolerate less bad treatment than trees.

WHEN TO PLANT — SPRING OR FALL.

This is a question often asked. I do not consider it of as much importance as many do. It is not half as important as a thorough preparation of the soil, mulching and thorough cultivation. With most forest trees it really makes but little difference. For several years I have planted largely, commencing in the fall as soon as the leaves fall, planting until winter comes, heeling-in or burying what is left, and in the spring commencing again and planting right along till 20th of May, or until the leaves start. Some seasons there is no perecptible difference between spring and fall planting of most varieties of trees. Should it set in very dry, as it sometimes does early in spring, and continue dry for several weeks, your spring planting will suffer to a certain extent, limited, however, by the amount of mulching and cultivation the trees receive during the season of trial. Should there be a reasonable supply of moisture during the spring and early summer, no appreciable difference would be likely to be observed. Large sized trees, whether planted in the fall or in the spring, will quite frequently go through the first season making a good, healthy, vigorous growth, and if June and July of the next season is unusually hot and dry, succumb to the withering influences of the season. This, however, is largely prevented by mulching or cultivation.

Small forest trees, one, two and three years old, usually, and so far as my experience goes, have always escaped this peril. I have sometimes thought the transplanting of large forest trees from the forest to the open prairie, more hazardous in the fall than in the spring.

GENERAL DIRECTIONS FOR TREE PLANTING.

Be careful not to expose the roots of trees to the wind and sun more than is necessary during the operation of transplanting. More failures in tree planting arise from carelessness in this particular than from any other cause.

To prevent this, carry the trees to the field to be planted in bundles covered with mats; lay them down, and cover the roots with *wet* loam, and only remove them from the bundles as they are actually required for planting.

In planting the roots should be carefully spread out and the soil worked among them with the hand.

When the roots are covered press the earth firmly about the plant with the foot.

Insert the plant to the depth at which it stood before being transplanted.

Select, if possible, for tree planting a cloudy or a rainy day. It is better to plant after the middle of the day than before it.

All young plantations *must be protected* from cattle and other browsing animals—the greatest enemies, next to man, to young trees and the spread of forest growth.

PLANTS OR TREES PER ACRE.

The following table will be found very convenient, as giving the number of plants or trees on an acre, at various distances apart:

6	inches apart each way	154.240
1	foot “ “	43,560
1½	feet “ “	19,360
2	feet by 1 foot	21,780
2	feet apart each way	10,890
3	feet by 2 feet	7,260
3	feet apart each way	4,840
4	“ “	2,730
5	“ “	1,750
6	“ “	1,200
8	“ “	690
10	“ “	430
12	“ “	300
15	“ “	200
18	“ “	135
20	“ “	110
22	“ “	90
30	“ “	50

Rows six feet apart, and trees one foot apart in the row, 7,315 trees per acre.

Rows eight feet apart, and one foot apart in the row, 5,434 trees per acre.

Rows ten feet apart, and one foot apart in the row, 4,389 per acre.

One mile of wind breaks or shelter belt, requires 5,280 trees or cuttings for a single row, one foot apart in the row.

Æsthetic of Forests.

It is conceded by all travelers, that the inhabitants of wooded countries are superior to their kinsmen of the treeless plains. An unsheltered country where the winds are unchecked, and the heat of the sun is intolerable in summer, and desolation reigns supreme in winter, molds body and mind to be the very imagery of such environment. People there living become sinewy, bony, muscular, angular, positive, raspy. Forests are powerful aids to intellect in softening and rounding human passions into beauty of form and character. They present something to think of, and study, and love. Trees have symmetry and balance, evolving like attributes in the familiar observer; have companionship suggestive of social brotherhood; have voices toned to worshipful emotions. The very branches and leaves sing with the brook gurgles and wild birds. What a weird charm in every flower, and fern, and moss-clad rock! The woods seem haunted with nymphs and naiads, educating a spiritual idealism that, superstitious though it be, lifts the soul higher and nearer the Over Soul infilling and inspiring all.

Arbor Day.

In a well-prepared proclamation, his Excellency, Gov. W. R. Merriam, has appointed for Arbor Day in Minnesota, May 1, 1891, in which he urges the people to make its observance a practical success. D. L. Kiehle, Superintendent Public Instruction, calls upon all the schools of the state to engage in the beneficient work:

"It is one great object of our common schools to teach the young to wisely plan for the future, and there is nothing better to stimulate the mind of the child in this direction than to turn his thoughts toward the benefits likely to proceed from protecting our proposed prairie school houses from the blasts of winter and the fierce heats of summer by surrounding them with trees."

This beautiful festival originated in Nebraska, and Minnesota, under the leadership of the forestry association, was one of the first to follow example. An excellent program of exercises appears in a pamphlet, arranged by N. H. Egleston, of the Forestry Division at Washington, D. C.

Appreciating scientific and practical forestry, he says, "Since the observance of the day has been modified, as it was on its introduction into Ohio, it has spread rapidly through the country, thirty-seven states having adopted it. Its every way healthful and desirable features have so generally commended it also, that it has gained a foothold abroad and has begun to be observed in England, Scotland, France, and even in far-off South Africa."

Gov. Andrew H. Burke, of North Dakota, appointing May 6th for Arbor day, has made a happy and exemplary departure from the usual observance of the day by urging the good people there to "plant trees and their seeds, together with shrubs, vines and beautiful flowers. * * * I would, therefore, urge all citizens to make this day the commencement o a thorough and continuous study of Arbor culture and forestry."

Plant one tree at least and call it yours.

Arbor Day, 1889-1890.

COUNTIES.	1889.		1890.			
	Trees planted on Arbor Day.	Total No. of trees on school grounds.	No. of districts in which trees were planted.	No. trees planted on Arbor Day.	School houses situat'd in natural groves.	Districts without trees and unrepresented.
Totals	9,890	29,395	423	8,492	747	2,640
Aitkin	40	228	....	10	All	....
Anoka	13	247	....	6	All	....
Becker	193	430	5	88	16	40
Benton	10	20	1	9	21	11
Big Stone	14	128	2	42	....	....
Blue Earth	197	1,606	11	158	19	100
Brown	157	1,409	15	383	....	....
Carlton	....	....	1	6	....	....
Carver	48	709	10	172	9	40
Chippewa	261	624	10	249	1	41
Chisago	....	....	2	10	32	13
Clay	50	1,431	....	....	....	....
Cottonwood	113	240	2	43	....	....
Crow Wing	....	204	....	....	16	14
Dakota	174	448	3	25	....	80
Dodge	....	....	8	86	11	60
Douglas	103	220	2	50	40	27
Faribault	123	430	2	31	10	87
Fillmore	355	2,473	19	222	54	83
Freeborn	147	147	7	100	1	113
Goodhue	635	3,622	21	549	26	73
Grant	488	636	6	296	1	36
Hennepin	193	1,085	2	35	32	49
Houston	24	379	4	95	....	55
Isanti	126	384	2	89	....	40
Itasca	116	656	....	....	....	....
Jackson	....	....	3	38	....	....
Kanabec	....	....	....	....	All	....
Kandiyohi	545	1,035	6	144	....	65
Kittson	22	22	....	....	....	....
Lac qui Parle	55	135	6	132	....	84
Le Sueur	117	613	12	376	....	80
Lincoln	193	194	....	....	....	....
Lyon	132	540	6	119	2	64
McLeod	200	500	23	400	22	27
Marshall	32	50	2	36	16	37
Martin	14	734	17	225	1	77
Meeker	....	296	16	441	31	29
Mille Lacs	53	151	2	39	9	....
Morrison	....	....	1	24	43	8
Mower	286	2,608	4	27	17	63
Murray	....	....	9	368	....	67
Nicollet	98	302	4	83	....	52
Nobles	221	539	10	74	....	62
Norman	8	132	1	40	....	74
Olmsted	259	710	6	58	....	138
Otter Tail	428	1,221	7	415	....	219
Pine	....	....	1	3	13	6
Pipestone	400	733	7	146	....	50
Polk	152	199	4	132	25	165
Pope	100	214	1	20	13	59
Ramsey	95	250	8	80	6	10
Redwood	391	473	18	338	....	57
Renville	....	775	2	21	....	100
Rice	200	1,103	5	58	36	49
Rock	623	1.067	8	148	....	40
St. Louis	....	121	1	11	....	12
Scott	....	267	2	141	4	57
Sherburne	224	305	2	50	13	20
Sibley	36	283	2	73	....	75
Stearns	....	....	8	138	36	105
Steele	29	603	10	105	....	46
Stevens	27	228	5	187	....	39
Swift	300	610	5	175	....	69
Todd	....	....	2	21	....	78
Traverse	124	124	13	262	....	33
Wabasha	....	1,025	....	....	47	41
Wadena	40	70	2	11	24	6
Waseca	159	270	5	98	....	73
Washington	20	215	3	32	11	45
Watonwan	194	244	3	50	....	35
Wilkin	30	30	1	9	....	35
Winona	281	1,116	28	312	....	67
Wright	183	1,239	4	24	34	66
Yellow Medicine	39	293	3	54	2	64

Forestry Physics.

By O. O. Enestvedt, Sacred Heart, Renville Co., student in Farm School in University of Minnesota.

The loss to agriculture occasioned by frequent droughts, especially in the last few years, makes the question how to possibly increase and best preserve the moisture of the country, an important one. Among the factors which modify the climate of a country is the presence of forests, which have a direct and indirect influence upon its moisture, and as this factor is under our control, it is of great interest to us.

The main factor in the distribution of our circulating water supply is the sun, which by its heat, aided by the rotation of the earth, causes air currents which produce evaporation, filling the atmosphere with vapor. Anything, therefore, that influences the action of the sun or obstructs the passage of the winds, must influence the local distribution of water supply.

We start out from the physical law, that the cooler and quieter the air, the nearer it is to the point of condensation, and in proportion as the air is heated and set in motion, its capacity for absorbing and holding moisture without condensing it, increases.

In an open field the rays of the sun are reflected back from the earth, causing a greater heating of the air, and as there is nothing to obstruct the air currents, this heated and moving air will have its absorbing capacity greatly increased. The air in the woods, on the other hand, being protected to a great extent from the rays of the sun and sheltered, is cool and still, and is nearer to the point of condensation.

This cool, humid air will increase the dews of the neighboring fields, and it is possible that the cooler air rising from a forest and coming in contact with the higher, warmer currents of air, will lower their temperature, which will result in condensation and precipitation.

The most important mission of forests is undoubtedly to preserve the moisture of the country rather than cause it. The protection of the ground from the direct rays of the sun, has already been mentioned, and this results in a more humid atmosphere in the woods, as the absorption is less. This, together with the capacity of the forest floor for retarding and holding moisture, and the wind-breaking power of trees, all act as important factors of conservation.

In the prairie regions of this state and of the western states generally, the value of forests as a wind-break, cannot be too strongly emphasized. It has been found, that on our treeless western plains, where the winds have free sweep and the ground is subjected to the direct heat of the sun, the quantity of water lost by evaporation is six to ten times greater than in forest regions.

Forests also prevent the snow from drifting off into great masses; they distribute it evenly over the ground.

Another equally important factor is the mechanical retardation of the run-off water from rain showers or from the melting snow in the spring. The trunks of trees, fallen branches, dead leaves and litter on the ground, all tend to hold the water back till a great part of it has had time to soak into the ground, and the remainder is given off gradually. Forests thus reduce the danger of damages by freshets, and equalize the flow of water in our streams as well as in our springs and wells, which all are dependent on the water that percolates through the upper strata of the ground.

To sum up: Forests possibly effect the local rainfall, by their cooler air coming in contact with and condensing the warmer currents of air, but their greatest value is as conservators of moisture because of their protection against sun and wind, and their mechanical retardation of the run-off water.

Russian Willows and Poplars.

Experimentation on the state farm under Prof. S. B. Green's supervision, also by others in different parts of the state, demonstrates the reliability of some of the Russian willows and poplars for rapid growth and hardiness. The following are most valuable:

The Salix acutifolia is recommended for wind-breaks. Prof. Budd says it is valuable in the northwest "where the summer and winter air is dry and the rainfall light."

The Salix fragilis "is perfectly hardy," says Prof. Green: it is a free grower; in Europe is considered the most valuable of all the willows for lumber. The bark is used for tanning the valuable Russian leather. It should be planted extensively on our western plains for wind-breaks, for tying material, for fuel; for tanning purposes.

The Salix laurifolia (Laural-leaved willow) is regarded as having the most beautiful foliage of all the willows. It graces the lawn and is a rapid grower. Its new growth is close jointed and has a shiny light green color; is seldom attacked by insects.

The Salix aurea "is perfectly hardy, very ornamental and makes a good wind-break, becoming a large tree with age; of clean, rapid growth and good foliage, but its chief beauty lies in its golden bark."

Prof. Budd recommends the Laurel-leaved poplar and popular Siberica Pyramidalis as well adopted to our climate and equal if not superior to our cottonwood for hardiness and quality of timber.

All these and other Russian willows and poplars can readily be propagated from cuttings; which are to be treated as herein described for our native willows and poplars. Judging from present tests the Russian will take the lead.

Broad-Cast Seed Planting.

The rainfall is so meager in our state, the soil must be plowed deep and well pulverized ere it is fitted for the reception of the trees. Experiments have been tried, and in some cases with considerable success, by sowing the forest seed broadcast, such as the box elder and ash, in the late fall as is done in some parts of Europe, where the conditions warrant. This method has some promise when the season is moist and the soil is loosened up very deep. J. S. Harris, one of our forestry veterans, calls this "nature's method worthy of imitation." The conditions of soil complied with and the seed well dragged in, they will surmount the difficulties, but will have comparatively slow growth, and will thin themselves out on the principle of the "fittest," and in time be a dense and beautiful forest. This is the cheapest way by far; try it.

Do Forests Promote Rainfall?

Phenomenal evidences indicate that forests promote rainfall by virtue of increasing the humidity of the atmosphere. Marsh, in his "Man and Nature," avers that forests promote the frequency of showers, and if they do not augment the amount of precipitation, they equalize the distribution throughout the season. The historian tells us the early governors and settlers of St. Helena cut off the gum wood, the ebony, the redwoods, and the severe drouths followed with ruinous losses of crops and cattle. Toward the close of the last century the government forestized the arid localities, and the rainfall was restored with the old prosperity. Because showers do not fall upon the region where the forests are, it does not follow that such have not promoted the rainfall somewhere. Either silently or by visible rupture trees are conduits of the electrics between the earth and atmosphere; and who can successfully deny that by this subtle interchangeability showers are generated in the superincumbent strata of air? It is certain trees exhale humidity that enters into the final work of precipitation; that they husband moisture under their shades and among their carpets of leaves, mosses and roots, and by evaporation render the atmosphere more humid, and thence the rainfall more facile and certain. Who, on the treeless prairie in mid-summer, has not observed how oft all the signs of rain vanish into thin air? The boys have the right idea about it when they say: "It is so dry the rain can't get down."

During an excessive drouth the atmosphere, like a dry sponge absorbs the "misty shrouds," and what condensation then obtains in the air may be blown afar to other regions. During the two hundred days of forest vital action, the wood, according to Schleiden, exhales a quantity of moisture equal to an inch and one-fifth of percipitation per day; this vapor escapes upon the air, and though enough to make a perpetual drizzle, it is not easily detected by the hygrometer. It has been demonstrated that evaporation from land clear of forests is about five times that from forest leaves. Dalton proved that a strong wind evaporates water about twice as fast as light wind. It is safe to say evaporation is equal the velocity of the wind. Hence, the necessity of forests to break the force of winds. "The temperature of the earth and atmosphere," says Dr. Brown, in his "Forests and Moisture," is lower amidst abundant vegetation than in a barren, sterile, stormy district, probably by the heat being absorbed and retained in a latent form by the process of vegetation in the one case, while in the other it is reflected unchanged. In consequence of this, if a wind any degree hotter, blow over the district covered with trees, this wind is cooled down, in a geometrical ratio with every fall of temperature, and a large deposit of moisture may follow in the form of dew, of mist and of rain."

It is the opinion of forest authorities in Prussia and Bavaria that rainfall is more abundant and regular in districts well wooded than in bare lands. They offer as a reason that the air within the forest becoming warm by the absorption of heat, both from the ground and the air next above it, leaves over the forest a current considerably colder than the neighboring air, and the rain clouds passing over are, in most cases, condensed by coming into contact with this colder atmosphere.

Forest Seeds and Seedlings.

Select from middle aged trees that are perfectly healthy and removed from choked-up thickets. Avoid the first and last installments. If you buy, patronize reliable dealers, for there is fraud in seeds as in anything else.

To preserve them over winter, keep them cool and safe from drying out by a mixture of sand.

Experience teaches that for our northwest prairies, ash and box elder do well when sown late in the fall. If you prefer the spring sowing, soak in water till swelled out plump, especially the ash.

Costs and losses considered, sowing in beds for transplanting is the more practical.

Manure on the site is not necessary. Have the soil deeply plowed and finely pulverized.

Comparatively thin sowing gives large and healthy trees.

B. E. Fernow, chief of Forestry Division, calculating from lineal feet of drill, estimates the quantity of seed as follows: Maple, honey locust, cherry, ash, box elder and the like, 20 to 35 drill per ounce: catalpa, alder, birch, elm, etc., 40 to 45 feet; pines, one ounce to 10 feet; larch, one ounce to 25 or 30 feet; black locust, 40 feet; chestnuts, acorns, hickories, butternuts, one pound to 10 or 12 feet; walnuts, one pound to 5 feet.

For distances apart of drills, 4 inches for conifers. For deciduous seeds, 9 to 12 inches; for the field, 2 to 3 feet as room for the use of the fine-teethed cultivator.

Do not cover too deep, for it retards germination. Mr. Fernow, basing his conclusions on experience, and nursery men here argree, recommends for maximum depths, 1¼ to 2½ inches for oaks and chestnuts, ½ to ¾ of an inch for maples, ash and box elders; 2 inches for black locust; 1-5 to ⅓ of an inch for alders; ⅓ to ½ an inch for spruce, Scotch pine and larch; ¾ of an inch for Austrian pine; birch and elm, thin as possible to ensure germination. Fall sowings may be covered more heavily.

Have the earth-cover above the seed loose so that air and moisture can readily penetrate to aid in dissolving the food materials in the seed. The quicker the sprouting the less danger to the seeds.

Guard against hot air and strong light. Keep the water supply at the roots and the degree of light and heat at the top properly balanced. Avoid too much water for the plantlets; most plants are then liable to rot.

Some seeds lose their power of germination soon after ripening, and must be sown at once, such as the elms, birches, poplars, soft maples, etc. The oak, chestnut, ash, box elder, hard maple, basswood and fir, can be kept over one season. The spruce, larch and pine can be kept for many years. The heavier and larger seeds produce the best plants.

Stir the ground frequently between the drills and master the weeds, and in dry weather not deeper than 1 to 2 inches.

The rule of European experts is to transplant from the nursery beds to the plant beds and thence to be transplanted into their permanent sites when two to four years old, as the species of trees warrant. In our prairie country we generally transplant our deciduous trees from the nursery to their permanent sites when one year old, and find it the more economical and practical method.

Cottonwood from seed is very difficult to raise on cultivated fields. The chief dependence is on what are pulled up along the river and lake shores. It will be a saving of money and vexation, if you purchase in the fall, for then the trees are in their best condition. As such dealers heel-in with the bands on and tightly bound, they are apt to heat in their beds and are more or less ruined in the spring. The decay generally commences close down to the crown of the roots, noticeable in a black, dead ring, affecting mainly the inside ones. Even the roots of such plants are unsound and generally incapable of sprouting again. To get your money's worth, have your cottonwoods in your hands in the fall. Note the count, how they are packed, and the quality. No pay unless they are genuine. If all right, cut every band; spread out thin in the heeling-in bed; lay them in shingle fashion on a slant where the ground is well drained; cover the tops with moist dirt, and they will come out of their cozy nest in the spring bright as gold dollars, and worth a hundred fold more if you plant and cultivate them in a scientific manner.

Best of Wind-Breaks.

Attention is called to the fact that evergreens constitute the most compact and reliable wind-breaks. A forest of such about four or more rods wide breaks down the tempestuous wind and lulls it to sweet repose on the leeward side. A test of this is given in Consul-General Winchester's report of a tempest in Switzerland. "On the 28th of September, 1885, a snow storm of unusual severity visited Zurich and the adjacent sections of Switzerland, and wrought damage which undid in the neighboring Lihlwald the careful labor of a century. The snow fell to a depth of nearly three inches upon the entire forest, and resulted in a damage of about two cubic meters of wood to every square acre, or a total loss of 3,000 square meters. One observation resulting from this storm will prove of permanent value in forestry, namely, that where the growth was largely intermingled with the leaf-bearing, there the storm met its fixed limit and was arrested. In a few cases branches were broken from the firs, larches and pines, but not a single trunk among them was either split or broken, whereas among the leaf-bearing trees standing alone the devastation was complete."

While the drouth is severe, keep the cultivator going among your trees, as you would for corn, but cultivate shallow, especially in the latter part of its season. Stirring the soil so brings up the moisture from below on the principle of capillary attraction, preserving the circulation of the plants. Ordinarily it is best to stop cultivating about the middle of July, thus allowing the plants time to ripen their cells for the winter. Let the weeds then grow "to their heart's content," for they not only protect the trees, but trap the snows, which are nature's mulching. If you cultivate later, the work of constructing fresh cells is renewed, disparaging the ripening process, and the over strain on the roots enfeebles them, and the plants kill down to the snow line.

Put evergreens here and there among the apple trees of the orchard. They protect from the sun scald, and impart a healthful influence upon all your fruit plants.

Home Ornamentation.

How little attention is paid to the beautiful around the homes in town and country! With comparatively slight expense and care and the exercise of good taste, they can be made so attractive there will be far less disposition to leave for new localities. Happy exceptions allowed, our prairie homes are really forlorn in environment. Why not jewel them with evergreen and vine screens, hiding the unsightly of outbuildings, relieving the stiffness of outlines, the repulsive of back yards, and sweeten all the walks in summer with floral fragrance? Even in winter the spaces all around the buildings can be so shadowed as to present a most enchanting effect. What is more weird than the festoons of trembling snow pendant on the evergreen limbs, the bright bark of the golden willow, the fire-light of the red-twigged dogwood, the white ear-rings of the snow, berry, the scarlet fruit of the bittersweet, the pale cleanness of the white birch? Let native grape vines climb over the veranda and outbuildings, also the woodbine, the clematis vitecelli with its purple flowers. For flowering shrubs both for hardiness and thrift, Prof. S. B. Green, horticulturist at Experiment Station, St. Anthony Park, recommends the following, a selection which I unreservedly endorse for our climate:

Missouri Currant.—This well known hardy shrub is one of the cleanest early spring flowering plants that we have. It grows strongly and flowers profusely, and is well adapted for the purposes of screens and ornamentation.

Lilacs.—All of these except the narrow leaved kinds are very desirable. The white variety is probably the most attractive. They are very valuable as screens and for hedge purposes. The common purple kinds is a freer grower than the white.

Spireas.—Most of the shrubby spireas are hardy and desirable here. I would call special attention to S. Van Houtii, S. Douglassii, S. Reeosii and the Golden Leaved Spirea. The latter is very pretty in both flower and foliage .

Snowball.—You have all known it from childhood. It is very attractive with its white balls of sterile flowers.

High Bush Cranberry.—This is the natural form of the Snowball, and it bears edible fruit and grows in our native woods. It is pretty in flower and in foliage, and is especially attractive in autumn when loaded with its red fruit.

Bush or Tartarian Honeysuckle.—These are hardy and desirable. They grow about eight feet high and flower profusely every year. There are several varieties, which differ principally in the color of the flowers.

The Snowberry is a nice clean shrub, which bears white berries that hang on the branches all winter. Very desirable.

The Garland and Syringa is hardy and a good, free flowering shrub. It should have a somewhat protected location. The flowers and their delicious fragrance and beauty are well known to you all.

A very pretty shrub is the Red-Twigged Dogwood. It is a native of our woods and makes a nice lawn plant. Its white corymbs of flowers are very attractive in summer, while its red bark is an attractive feature for a winter landscape.

Buckthorn.—I refer to the well known English buckthorn so often used in the eastern states for fine hedges. It makes a fine hedge or lawn tree here, is perfectly hardy, and will withstand any amount of dry weather or cold.

Hydrangea.—The hardy hydrangea is, I think, to-day the most popular lawn shrub grown. It flowers in August, when most other flowers are gone, and its great nodding panicles of white flowers are very beautiful while they remain white, and, in fact, until they drop off on the approach of winter. It is quite hardy and every lawn should have at least one such representative.

The Red-Berried Elder is a native shrub of much value. The buffalo berry, which grows on the prairies of the Dakotas and in most severe exposure in Montana and Wyoming, is very beautiful, with its white foliage and trim habit. It is dioecious, and so one must have both pistillate and staminate forms to secure the beautiful red fruit for which it is noted.

Ruinous Fires.

The lumbering operations of the country continually increase the danger of forest fires by the inflammable refuse left on the ground where they have cut the trees. To protect groups of standing trees from running fires, it is customary to rake away the rubbish around them and set it on fire. On a windy day such fires, escaping control, spread over vast territory to the destruction of the pine seedlings and other young growth. Thus the organic material in the soil is burned out, rendering the surface soil more sterile and non-protective to plants. If the more deeply rooted species, such as the Black-Jack oaks, springs up, they monopolize the little pines that may struggle to live, and the leaves in turn from these oaks become fuel for the next conflagration, till at length the ground becomes barren of any vegetation, and it is transformed into a desert region. Next follows the ruin of the water springs and the depletion of our lakes and rivers, and next the ruin of our crops near and afar. We of the open prairie are very apt to execrate the woodsmen for these fires, while guilt, if it may be styled such, lies close to our doors. No doubt our prairies were once covered with woods. The Indians set them on fire for the driving of game into their haunts, and for the removal of undergrowth that hindered pursuit. After many such fires, the woods were literally obliterated. Then the buffaloes rummaged over the plains, and fires were set to chase them on the hunt. The white men came and destroyed the buffaloes. The poor Indians received domesticated stock for lands. To obtain fresh grass for their half-starved animals, they set fires again, and they spread and ruined every little tree trying to get a foothold in the more moist valleys. Knowing the impending perils, even before there is a sign of fire, the white settler burns around his own premises, and away it runs like a race horse, scorching and ruining his neighbor's clump of trees. Thus the country of our adoption was made forlorn in the very efforts of human beings to protect their own. We gain nothing by execration. And legislation thus far is no antidote to our calamities. Hope rests in the occupancy and culture of the arable lands, in encouraging forestry on the new farms, in saving the remnant of native forests by converting them into parks, in placing the supervision of all under the state and national government.

Nut and Honey Trees.

There are sufficient pioneer trees, growing in the state south of 45 degrees, to warrant the successful raising of the nut trees on an extensive scale. Prepare the soil as before described. With the burs on plant the acorns, butternuts, walnuts, hickories late in the fall, where you want them to stay, say eight feet apart. On each side of the rows of nut trees set box elders, not over two feet apart nor over four feet from the rows, to serve as nursing trees that shelter against the winds and scorching suns. When the precious candidates have grown large and strong enough to care for themselves, cut out the box elders. Another way recommended, and perhaps more practical in some localities, is to completely surround and impact the nut orchard with the pioneer trees that are indigenous to our climate, and have all as one companionable forest. The nut trees are now our great need, and none are more profitable.

A credit, too, for the basswood. It is, indeed, beautiful, long lived, and valuable for timber and nectar for the honey bees. Honey, you know, is in growing demand, and "basswood honey" generally pays the best. In such sections, too, the hard maples can be made a business profit by utilizing their sugar properties. What trees are more graceful and attractive all seasons of the year? Orchards of this and the nut trees in the years to come, when we who plant them have gone to our reward, will be sources of great profit to our children and children's children.

And what of the hardy catalpa? It is so gorgeously beautiful when in bloom! Yes, it will thrive in the south half of the state. Col. John H. Stevens,in Minneapolis,has one twenty-five feet or more high, growing in perfect health in his lawn. The buildings of the city protect it safe. What a charming state our Minnesota can be made when liberally adorned with the nut and honey bearing trees, protected and fostered by the evergreens and elms! Let us who live farther north calculate and prepare for all these luxuries and beauties.

Planting and Caring for Evergreens.

"Prepare a screen to shelter them as follows: Set two six-inch fence boards, eight feet long, on edge, four feet apart, nail on lath leaving a space two inches wide between the lath. Have the ground worked deep and well pulverized; when the trees are received, unpack in a cool, shady place, shed or cellar; have ready a pail one-third filled with muddy water; place the roots in this, and carry to the place of planting. Set one-half inch deeper than they grew in the nursery; straighten the roots and work fine soil firmly around them; plant six inches apart in rows one foot apart; rake the ground smooth; cover two inches deep with fine straw or chaff; cover with the screen if the weather is dry; water freely, a barrel of water to each bed four feet wide and eight feet long; then don't water again until they need it. At the end of two years transplant to ground or lawn where they are to remain."

C. L. SMITH.

Forest Percentages to Balance Vegetation.

The necessity of forestry increases with the increasing cultivation. The fact is a startling one that our springs, lakes and rivers are fast drying up. Within a decade vast lake areas have become meadows. The water recession will augment more and more rapidly as the state fills up with population,and the soil is subdued for crops, unless immediate forest provision is made on a vast scale to avert the impending calamity. It is safe to estimate, that not over 10,000,000 acres, or about one-fifth of the dry land is in actual use. Yet this small amount of cultivated land, compared with the great whole, so absorbes the moisture, that our water area is fearfully failing us. What, then, must be conditions of soil and air, when at least three-fifths of the land is under the plow, unless we restore the depleted forests to a large extent, and build up new ones in the more cultivated regions? In round numbers, the entire acreage of Minnesota is 54,000,000. In its early history the area of the native forests, including adjacent or embraced water areas, was 8,352.000. Thus Minnesota, lying at the sources of the Father of Waters, had a superior advantage over many of her sister states. During the intervening years but a precious few attempted to forestall the drainage of our water area and atmospheric humidity by forestry. We have thus invited and are fast producing desert conditions. We have allowed our native forests to be well nigh ruined, and largely neglected to plant trees on the cultivated prairies where they are so much needed. The people feel the reaction, but why this lamentable indifference to meet it by reforesting our state? Every acre of cultivated ground necessitates a quarter of an acre of new forests. That is, we must have at least 25 per cent. of our entire state acreage devoted to permanent forests to furnish an adequate moisture as balance to our new growth of vegetation. Within ten years of forest destruction by axe and fire, our forest and water area is now not over eight to ten per cent. of the entire state area.

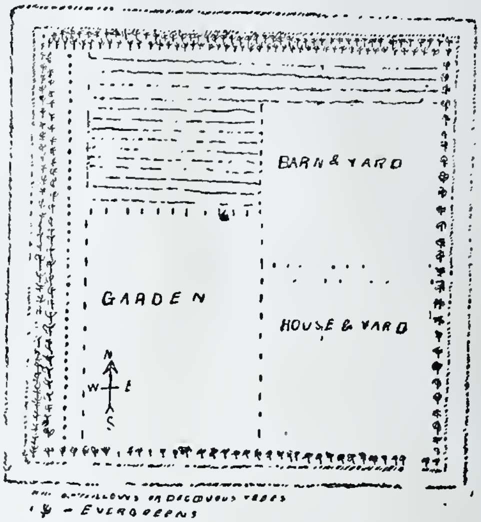
Just calculate again a moment and see how utterly impossible it is for our former water area to be restored even to half its magnitude, unless we convert 15 per cent or more of our territory to forestry, more especially among and around our water sources. An inch of rain is equal to 100 tons of water per acre. Multiply the millions of acres by the number of inches or hundreds of tons of water that have been absorbed in plowing —which formerly ran off, owing to the compactness of the soil—and we learn at once the losses to the volume of lake and river area, and the dry conditions of soil and air.

It is found that the wind west of the big woods on the open prairie, has a movement, in round numbers, of 8,000 miles per month average, while on the east side at St. Paul and all along northward, it is but 4,000 miles per month. Do the good folks on the leeward side ever stop to inquire, as the big woods are riddled more and more, what will be the condition of their crops in the "sweet by and by," unless the people rise to the rescue of the forests?

It is the opinion of experienced men that forest trees of different species ought to be mixed. Their differences of shade and chemical affinities are mutually supporting.

To Prevent Snow Drifting.

In Answer to the oft repeated question, "How can I plant trees to prevent snow from drifting around my farm buildings. C. L. Smith has drawn the accompanying plan, which doubtless is the most satisfactory yet devised for the prairie country. "Of course," he says, "it must be varied to suit the location of roads, lay of land, etc., but it will in a general way indicate the principles to be observed. A thick outer row to break the force of the wind, a wide open space to hold the snow, and then a considerable grove or belt beyond to still farther break the wind and hold any snow sifting beyond the open belt. The house is supposed to be in the southeast corner of the plat; the outside line is a double row of willows, set one foot apart in the row; then a snow space thirty to forty feet wide; another double row of willows, then evergreens one row on the south and east, and two rows (with the trees alternating) on the west and north; these last may be six or eight feet apart. Then rows of deciduous trees, ash, maple, box-elder, willow, or such trees as circumstances or taste requires; rows four to six feet apart in the row. It is better to plant a variety than all of one kind. After the outside rows, which always should be white willow, the more evergreens there are the better. Put an extra row of evergreens around the garden and along the west side of the barn-yard; also a double row between the house and barn, Start a little nursery of evergreens in the garden, at the same time the willows are planted in the outside rows, then, when the willows are large enough to shelter the evergreens they are ready to move from the nursery to their permanent place. Close planting, thorough cultivation or liberal mulching of the willows and deciduous trees, is necessary to success."



With but single rows, trees for the highways better not be set less than 12 to 20 feet apart. Where they are thick in the rows the snows drift in and intercept travel. Beside, so close walls prevent landscape perspective, and antagonize needed ventilation. When large the branches interlock.

Inter-State Forestry and Irrigation.

The rains from the Atlantic are spent ere the winds with which they are laden reach us. The rains from the Pacific are intercepted by the Rockies, favoring the slopes to the west. Hence, by virtue of locality the people in the upper valley of the Mississippi are left out, dependent upon such showers as may chance to fall upon us. Is there no art in our power whereby we can bring more certain rainfall? It has been demonstrated that the winds from the Gulf of Mexico and from across the more open continental regions to the southwest, blown inland from the Pacific, are highly charged with vapors, which, however, cannot enter into precipitation unless cooler winds from the polar country collide with the southern. But those cooler winds are so dry they absorb those vapors, generally rendering precipitation impossible. A medium is needed to so augment the volume of vapor as to cause precipitation before the drier northern winds shall have reached the southern, in fact to load down the northern with vapors as they sweep over the continental plains. That conjoining medium is a vast stretch of forests, interlocking over the whole continental table. The superincumbent air being cooler by virtue of forested shade and moisture, the vapors blowing from the south and southwest would cool down as they sweep over the forests, promoting precipitation and rainfall, blessing the people with good crops and healthfnl conditions. There is nothing, then, more important than the joint action of the Mississippi and Missouri states and the dominion of Manitoba to establish this medium of forests preparatory to the long-wished-for climatic change.

The citizens of both the Dakotas are now alive to the great emergency On those dry and wind-swept plains they have learned it is very difficult to raise trees. In their dire necessity to secure supplies of moisture to their crops and forest protection, they are commencing the development of a scientific system of irrigation on a vast scale, which has already proved preeminently practical. By so doing they are sure of promoting rainfall, when their purposed forestry is attained. In this undertaking Minnesota takes a deep interest. Dakota irrigation will doubtless be soon copied by people in the open sections of our state.

Gen. Nelson A. Miles, in the March number of the North American Review, 1891, aptly says: "Coincident with irrigation should be tree planting, which would in a short time not only change the appearance of the country, but supply the wood which is necessary for fuel. It would hardly be possible to estimate the value of trees in their usefulness towards reclaiming said land, and too much cannot be said in urging the profuse planting of them. In fact it would be well for the government, in selling lands reclaimed by it through the irrigation works to be established, to make it compulsory on the part of the purchaser to plant a portion of his acreage in forest trees. They would only require thorough irrigationd uring the first year, less of it the second, very little the third, and none at all thereafter. Tree culture, especially the planting of trees indigenous to the country, should by all means be encouraged."

In a communication on this subject, W. W. Barrett, superintendent of Irrigation and Forestry, North Dakota says, "Moisture is indispensable to the development of all forms of vegetation; and this is preeminently true of trees. Hence, the absence of a proper supply of water in the western part of our state has been almost the sole cause of failure in this respect. But by experience it has been discovered that irrigation by artesian or by surface water becomes the sure guarantee of arbor life and forestry in all the sub-humid regions of our land. Thus the people of our state, through legislative enactment and concurrent resolutions to congress, have provided that the two systems shall be made to work in harmony: Irrigation for trees and trees for moisture."

Economizing Crops.

The grain annually lost by a single storm of wind that uncovered it in the early spring, or by a sweep of hail that powders it into chowder, would pay for a belt of timber on the windward side of every cultivated eighty lot. The increase of our fruit crops alone would soon equal the cost of such belts. Where they are thus protected and otherwise cared for, the crops are good, while on the exposed prairie there is seldom over half a crop. A calamity this that naturally follows the unchecked winds that wrench the blossoms and young fruit from the trees. Buds and blossoms must have still air to develop into fruit. The trees themselves are the greatest sufferers on the open prairie. The southwest winds, pounding in as so many poisoned simoons, cause the trees to lean to the northeast, so that from 2 to 3 o'clock the hot rays of the sun fall almost vertically upon their naked trunks, vitiating the sap on their exposed sides, inviting the aphides and borers, and your orchard dies out. If you wonld raise fruit, "the food of the gods," shelter your plants by timber belts, wide and thick, more especially on the west and south sides. Enclose so on a broad-Scale for the orchard. Plant your apple trees 200 feet from the benevolent willows, cottonwoods, ash, box-elders and inside rows of evergreens; prune the apple trees low so that the limbs trailing down will shade the trunks; and what have you for your labor of love? A little eden of apples and small fruit in abundance for the home and a surplus for the market.

Prevention is Economy.

Destructive hailstorms visit us every year, literally ruining vast areas of growing crops. On the treeless prairies what is there to intercept? Nothing. The ravages on our native woods open the way for such storms to destroy crops on a yet more extensive scale. Every year the state and benevolent people are asked to relieve the sufferers, and hundreds of thousands of dollars are donated. When these losses can be averted, is it not economy so to do? It has been demonstrated in Germany that, "after high class clearing, the hailstorms had increased to a remarkable degree, and that they were less frequent and in some instances had ceased altogether, where a new forest growth had succeeded a cleared area. Forests of great extent are said to prevent the formation of hail. But in this respect a marked difference has been observed between coniferous and deciduous woods. And it is stated that places in which coniferous forests predominate are more rarely visited by hailstorms than places where deciduous forests largely preponderate."

What has Ruined the Oriental Civilization?

Long continuous drouths, breeding locusts and other preying insects, as in Asia Minor where the forests have been cleared, impoverish the people, and when generation after generation is thus robbed of the supports and comforts of life, they retrograde into national imbecility. You remember how proud and opulent was Syracuse. It was environed with variegated forests and watered abundantly. When the forests, ever a corollary of civilization, were ruined, the springs and rivers dried up, and the bare relics of this classic city are sunken in a sand desert over which sweep uninterrupted the hot siroccos of Sahara across the Mediteranean sea. That African Sahara, how it shrieks the despair of nature! for on that wild waste was once a forest developing the world's civilization. The Island of Cicily, how famous in history! Once the great grain conservatory of Rome, now changed from mildness to rigor of climate, its ancient fertility is almost lost. What the cause? Cicily was despoiled of its magnificent forests. Algiers is subject to drouths and famines. What the cause? Ask the howling winds reporting another wreck by deforestation where the Ptolemies rocked the cradle of science. What of Ceylon, once so like an Eden in climate and beauty? Alas, how riven, how changed for the worse since the greed of the English speculator has raided her venerable forests. What of Mauritius so humid in atmosphere centuries ago, so prolific with sugar plantations, so healthful for its contented people? What has happened that extreme dryness and fevers and failures of crops succeed each other there? The answer repeats again—her native forests have been cut down. What of Australia? No sooner was gold discovered there, than the great forests were invaded by the English lumbermen; the ax and fire paved the way for the severe drouths, and almost utter destitution of water springs abounds in the more desolate regions of the island. What of Bucharia in Central Asia? What of the Siberian peninsula under the rule of the Moorish Calebs? What of the haunted coast of the Adriatic sea so heavily timbered in the time of Constantine? What of Spain, once the most luxurious and powerful nation of Europe, now fourth rate, her people sunk below par in wealth, in enterprise, in enlightenment, in progress? What of Russia whose subjects have for centuries continued to waste their woodland until the imperial government has lately commanded a halt? The same besom of destruction has swept over them all. Compared with their former condition, they are arid regions now; deforestation has ruined them; they are drier, more desolate, more exposed to blasting winds and floods. And there is Palestine; in its palmy days it was a wealth producing and variegated country, rich in forests, in vines, in grains, in fruits. These and the sacred waters, where are they? Even the Jordan, whose ancient gurgles hymned the spirit of prophecy, is but an insignificant stream, its enchantment, save in story, forever gone. Where are the great cedars that stood for centuries in the valleys of the mountains of Lebanon, their shadows so restful to the Hebrew prophets, their towers of green reporting the voices of ministering angels? Alas, how barren now, naked monuments of departed prosperity! What has caused this sad reaction, this dwindling down of Palestine's population till now it is about one-sixth of what it was in the days of Solomon? Why did the light of primitive Christianity, once like the noonday sun there, dim into the night of unfaith, fit condition for the Saracen and Bedouin robber? The answer ever is, that the people retrograde under the deforestation of their country. The landscape's desolation that followed the Vandal's axe, the consequent drying up of those waters producing sterility of soil, beggared humanity in capacity of inspiration and moral character, and Palestine with Jerusalem, the religious capital of this planet, is to-day the "abomination of desolation" as foretold by the Nazarine when he wept over the city. Christianity in its pristine beauty could no longer flourish there. Like a white winged dove it had to leave for other climes where trees and waters and flowers and rich lands invited it.

The Sweep of our Winds.

The climate of the prairied northwest is subject to great extremes of heat and cold, chilling, freezing things at their touch. Ours is the gateway through which the blizzards pass on their march of destruction to states farther east and south. Their movements from borean realms are not direct down the Central Minnesota Valley. As they reach Hudson's Bay and the lakes in that far-away region, where the summer heat is measurably stored up,they are warded off or deflected against the Rockies, thence following the ice of the mountains that wall out the warm currents of the Pacific. The great treeless plains in front facilitate their escape to the east on the track of a low barometer, and there they pelt us with their terrible fury. Thus most of our cold and deadening weather comes from the west and southwest. Any one who thinks must see that there is no possible escape from these perils to our crops and fruit plants, houses and stock except by covering these plains with forests to break and soften the destructive winds. Our entire country is concerned here. Once build up forests over the Dakotas and Minnesota, and we change the climate of the vast slopes from the Rockies to the Atlantic and the Gulf. When will the people rise to the emergency?

The first settlers of our state tell us about raising from 30 to 40 bushels of wheat per acre. Gradually the amount has shrunk down from 12 to 8 bushels on an average. What does it portend? exhaustion of the soil? No! The former moisture in soil is leaving us. Farmers demand higher prices for their productions; but what is the need of prices if we have no crops to make prices? It's a miserable shift of tariff reform, or of any other reform, to further neglect this most vital of all reforms—forests on our waste lands—forests on our farms.

The most reliable trees for the open prairie, say north of 45 degrees, are the white and green ash and the white and Russian willows. They do best transplanted when one year old. In fact young trees are always safer than older ones, and in the long run will outstrip them. Plow deep, set deep, cultivate from deep to shallow till into July, and they will endure almost any drouth. When four or five years old the ash grows rapidly, competing with the box elder, and living longer as a more valuable tree.

Injurious Insects.

Prof. Otto Lugger, entomologist of the Experiment Station at St. Anthony Park, speaking of preying insects infecting our poplars and willows, says they "become injurious only when the trees are neglected. By paying as much attention to them as to his other crops, by carefully inspecting them from time to time, the farmer can keep all these insects out of them, or at all events he can keep the intruders in check." Prof. Lugger recommends the use of a spraying machine with which to sprinkle the plants with a kerosine-emulsive that will kill the insects, composed of the following ingredients:

"Kerosene, 2 gallons	67 per cent.
Common soap or white oil soap, ½ pound,	33 " "
Water, 1 gallon	

"Heat the solution of soap and add it boiling hot to the kerosene. Churn the mixture by means of a force pump and spray nozzle for five or ten minutes. The emulsion, if perfect, forms a cream which thickens on cooling, and should adhere without oiliness to the surface of glass. Dilate before using one part of the emulsion with nine parts of water. The above formula gives three gallons of emulsion and makes, when diluted, thirty gallons of wash."

Tree Longevity.

Every one knows that apple trees in our west are shorter lived than in the east. So of our forest trees. On the Atlantic and Pacific coasts where the sea evaporation is plentiful, they attain far greater age than grown in our mid-continental region. In England some English oaks have lived a thousand years; in America they are past their best in 150 years. Evergreens that endure 25 degrees below zero in Great Britain, have been killed down at 10 degrees below in Philadelphia, Why is there this marked difference? It is no doubt due to atmospheric conditions. Ours is dry, involving a drain of moisture, and a strain that shortens the life of the tree like starvation to a man. The business on hand is to grow forests on a larger scale to promote atmospheric humidity.

Plan of Protection.

Where a country is well wooded, abundant in grasses and grains, and in flowers that emit the volatile oils, the vapors thence arising form a film of protection in the atmosphere, that reflects back to the soil the radiating heat at night, thus like a gauzy mantle holding over and around the plants sufficient caloric to prevent the dews from freezing. When the sky is clouded our plants are safe from frosts; forests are guards of all our crops.

Experience in our windy climate has taught us that trees for a forest do the best when planted close, not over six feet apart on an average. The secret doubtless is, they better protect each other against the windy blasts.

Nationalization of Forestry.

The very fact that forest trees benefit all, and in this sense belong to all, is reason enough why forestry should be nationalized in order to protect it and enforce its culture wherever needed. We compel education; and it is equally consistent and important that we compel forestry, whose influences not only enrich a country but greatly aid in elevating the character of its citizens. Have we not had enough of this so called individual sovereignty that arrogates to itself the prerogative of the bloodsucker?

An eminent authority on forestry science, Dr. Otto Von Hagen, makes this statement respecting the rights of the government where a people have deforested the country, producing general injury: "When such evils reach the stage of common danger, and this is in a great measure already the case, it then becomes a duty to interfere by legislation."

Chief Forester Donner, of Germany, presents this irrefutable truth which only indolence and selfishness can ignore: "Forests are property in trust, coming from old times to us by descent, the value of which does not consist in the immediate yields of wood, but substantially in the utility which it indirectly affords by its influence upon climate, temperature. protection, conservation of the soil, etc., hence to the civilization and culture of the whole country."

All the governments of Europe are now giving special attention to forestry. It could no longer be safely postponed; the dire necessities of the people demanded it, and those governments have promptly risen to the emergency. Germany leads. It has built up a gigantic system of forestry by nationalizing it—just what our republic will have to do, and that soon, or vast portions of our territory, naturally rich, will change into deserts. While the German government does not interfere with the personal rights of its citizens as legal owners of forest tracts, it holds a supervisory control to maintain the needed atmospheric humidity by evaporation from the leaves and stored up waters. It determines where forests shall be made permanent. Severe laws are enforced by officials appointed for the purpose, who have passed the degree of forestry scholarship. Those dense woods make the air healthfully humid; they feed the springs to the numerous streams and rivers of that now rich and beautiful dominion, and good crops are secured to the people in abundance.

Germany may be truly said to be a vast and well watered garden. Education and forestry, counterparts of each other, have developed there the most scholarly and masterly nation in Europe. What renders its forest system so efficient is its legal system of supervision. All the governmental tracts, however large or small, are mapped off, every tree dotted down and defined in location, its age designated, and no tree is allowed to be cut without order, and its disposal put on record. New trees must take the place of the old ones somewhere. Forestry schools are maintained by the government, in which students are educated in all the branches correlated with flora, such as geology, chemistry, surveying, botany and meteorology in all their multiform phases and applications. This munificent provision and protection of forests, rigidly enforced, is certainly worthy of imitation by all the enlightened nations on the globe.

Note what a miserable apology we of the United States have to proffer by way of example. Our national government for long, long years has indifferently refused to give the matter any special attention. The same savage neglect has characterized our legislatures. Forest vandalism allowed and even protected, annual fires destroying the young tree growth regarded as of no consequence, desolation everywhere in the Union—only think of it! And what follows? Why, just what we are realizing—dried up waters, dry atmospheres, miserable crops. It would seem as though the very prisoners of hades had broken loose to ravage and destroy what is absolutely essential to civilization and its blessings.

The following is a schedule of the science of forestry as taught in Germany. It casts America far into the shade. Not until we rise to the emergency and institute a like system or one better adapted perhaps to a free people, can we reasonably expect a lasting success:

1. Forestry real: General management, planting operations, valuation surveys, rotations and details of working plans, transport and scale of timber and other forest produce.

2. National science with special reference to forest requirements, meteorological phenomena, organic chemistry, nutrition of plants, systematic botany, entomology.

3. Mechanics, surveying and engineering with road making.

4. Forest legislation and police.

Pupils for forest professorship, after proficiency in specialized branches have to go through five years' training as qualification for forest service.

In France as in other parts of Europe the government has nurseries where seeds are collected and shrubs are propagated for planting, and these are supplied gratis to planters, under an official corps that, being salaried, freely instruct them in the methods to be pursued. Private owners of forests in villages and low lands are allowed an unrestricted right to cut their timber, but in high woodlands, even if privately owned, the government carefully regulates the cutting, forbidding the felling of any tree without special permission.

"Every tree planted and cared for is worth more to the community as a whole than to the individual; if A plants a grove of ten acres on his farm, every farm in the neighborhood is benefited. If one-half the farms in a county were provided with ten or twenty acres of forest each, it would greatly increase the value of the adjoining farms. Four-fifths of all argument regarding the value and advantages of timber culture apply to the community as a whole more than to the individual, therefore, we claim the state should foster and encourage tree planting by every available means. A liberal annual appropriation should be made to carry on the work; everything pertaining to the subject should be investigated; reports should be made, successful methods should be freely and generally distributed. The attention of the people should be continually and persistently called to the importance of the subject."

LEONARD B. HODGES.

The Minnesota State Horticultural Society, at its meeting in Excelsior, Jan. 21-24, 1890, adopted the following resolutions, presented by the committee on forestry, consisting of J. O. Barrett, Brown's Valley; S. H. Folsom, Excelsior; J. T. Grimes, Minneapolis:

WHEREAS, Forestry is an essential branch of horticulture, without which no permanent progress is attainable in fruit, field and garden productions, and

WHEREAS, The devastations of our native forests must, as in other parts of the world where this curse falls, transform our naturally rich lands into desert conditions, by drying up our springs and depleting our lakes and rivers, to the injury of navigation and all other industries, and

WHEREAS, The provisions of the timber culture act* have proved impracticable, not being wisely defined and enforced, making failures the rule and success the exception; therefore, by the Minnesota Horticultural Society be it resolved,

First—That forestry be nationalized, and classified with agricultural, horticultural and waterways improvements.

Second—That Congress make an adequate appropriation for the above purpose, and for greater encouragement to the settlers, including the merits of the work, for the growing of forest trees on their farms.

Third—That Congress appoint a board of forest commissioners, representing different states, whose duty it shall be to protect and preserve such native forests as they deem necessary for the general welfare, and see that valuable and hardy trees are raised under their supervision on government lands, around our lake and river sources, and over and around our barren hills, mountains and desolate places, and wherever else in their practical judgment they are needed to mitigate the rigors of extreme heat and cold, and to protect our crops, stock and homes against the hyperborean and simoon winds and storms, to which our prairie country is now exposed.

Fourth—That our society respectfully invite all our sister horticultural societies in the United States to co-operate in this important enterprise.

Fifth—That printed copies of this preamble, with the resolutions, be sent by our secretary to all the congressional members of Minnesota and the Dakotas, with letters asking them to lay the claims of this movement before Congress without delay.

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*At its last session congress repealed the timber culture act together with the pre-emption, thus necessitating now a more certain system of forestry, under the direct supervision of government.

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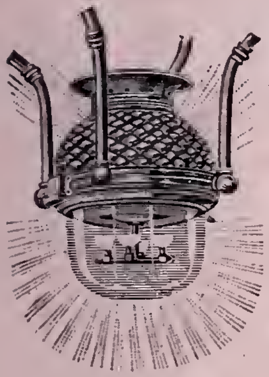

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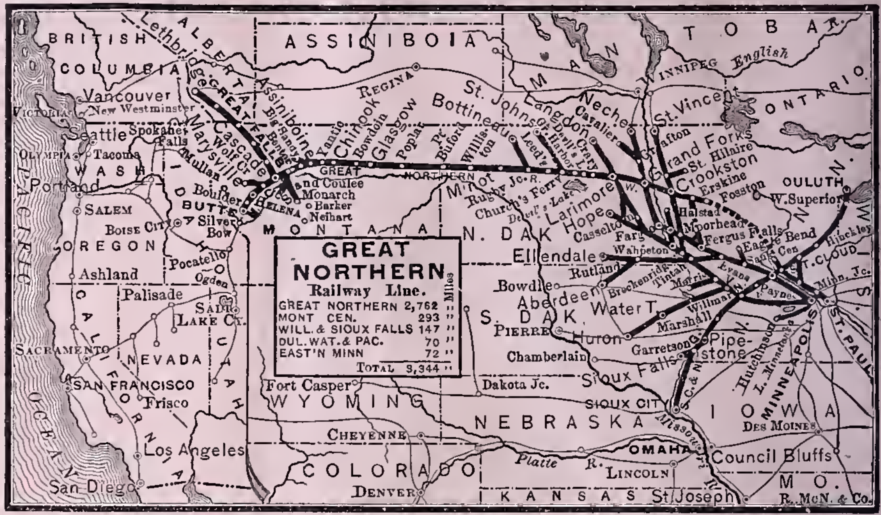

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